

SPECIFICATION AMENDMENTS

On page 1, insert above line 1, insert--Priority Claim

The present application claims priority on European Patent Application 03291598.5 filed 27 June 2003.--

On page 1, above line 1, insert--Field of the Invention--

Paragraph on line 1 of page 1 has been amended as follows:

-- The invention is directed relates to a process to prepare a base oil having an paraffin content of between 75 and 95 wt%.--

On page 1, above line 4, insert--Background of the Invention--

Paragraph on line 20 of page 1 has been amended as follows:

-- US-A-Pat. No. 6294077 describes a catalytic dewaxing treatment wherein a catalyst is used consisting of ZSM-5 and platinum.--

Paragraph on line 23 of page 1 has been amended as follows:

-- US-A-Pat. No. 6025305 discloses a process wherein a Fischer-Tropsch wax feed is first hydroisomerised. The effluent of the hydroisomerisation is then separated into fuels and lubricants. No pour point reducing treatment is disclosed in this publication.--

Paragraph on line 1 of page 2a has been amended as follows:

--The object of the present invention is It would be useful to provide a process wherein a base oil with a paraffin content of between 75 and 95 wt% is obtained which does not have the disadvantages of the prior art processes.--

On page 2a, above line 5, insert--Summary of the Invention--

Paragraph on line 5 of page 2a has been amended as follows:

-- ~~This object is achieved by the following process. The invention provides a process~~ Process to prepare a base oil having an a paraffin content of between 75 and 95 wt% by subjecting a mixture of a Fischer-Tropsch derived feed and a petroleum derived feed to a catalytic pour point reducing treatment.--

On page 2a, above line 10, insert--Detailed Description of the Invention--

Paragraph on line 30 of page 3, ending on line 8 of page 4, has been amended as follows:

-- A very interesting suitable petroleum derived feed is the bottoms fraction of a fuels hydrocracker process. With a fuels hydrocracker process in the context of the present invention is meant a hydrocracker process which main products are naphtha, kerosene and gas oil. The conversion, expressed in the weight percentage of the fraction in the feed to the hydrotreater-hydrocracker which boils above 370 °C which are converted to products boiling below 370 °C, in the hydrotreater-hydrocracker process is typically above 50 wt%. Examples of possible fuels hydrocracker processes, which may yield a bottoms fraction which can be used in the present process, are described in the above referred to EP-A-699225, EP-A-649896, WO-A-9718278, EP-A-705321, EP-A-994173 and US-A-Pat. No. 4851109.--

Paragraph on line 9 of page 4 has been amended as follows:

-- Another interesting suitable petroleum derived feed is the fraction obtained in a dedicated base oil hydrotreater-hydrocracker. In such a hydrotreater-hydrocracker the main products will boil in the base oil range. Typically such processes operate at a feed conversion of below 50 wt% and more typically between 20 and 40 wt%. The petroleum derived feed is thus the high boiling fraction as obtained in such a process prior to dewaxing. --

Paragraph on line 17 of page 4 has been amended as follows:

-- Preferably the fuels hydrocracker is operated in two steps, consisting of a preliminary hydrotreating step followed by a hydrocracking step. In the hydrotreating step nitrogen and sulphur are removed and aromatics are saturated to naphthenes.

Paragraph on line 22 of page 4 has been amended as follows:

-- An even more preferred feedstock is a dewaxed oil. This oil preferably has a pour point of below -10 °C, more preferably below -15 °C. Dewaxing ~~can~~may be solvent or catalytic dewaxing. The saturates content is preferably greater than 90 wt%, more preferably greater than 95 wt% and even more preferably greater than 98 wt% and most preferably higher than 99 wt%. The sulphur content is preferably less than 0.03 wt%, more preferably less than 0.01 wt% and even more preferably less than 0.001 wt%. An advantage of using a dewaxed oil having such low contents of sulphur, nitrogen and high contents of saturates is that no additional hydrofinishing is required after performing the pour point reducing step of the process of the present invention. Advantageously the catalytic dewaxing will then not have to be performed at the higher pressure required for the subsequent hydrofinishing. In contrast it can be performed at a more preferred lower hydrogen pressure range of between 40 and 70 bars. Omitting such a hydrofinishing step is especially possible if the mineral derived dewaxed oils themselves are prepared by means of a process which does include a hydrofinishing step, preferably performed at a hydrogen pressure of above 100 bars. Examples of such hydrofinishing processes are for example those described below.--

Paragraph on line 20 of page 5 has been amended as follows:

-- Preferably the ~~T10wt%~~ T_{10wt%} recovery point of this oil is between 200 and 450 °C, more preferably between 300 and 420 °C and the ~~T90wt%~~ T_{90wt%} recovery point is between 300 and 550 °C, more preferably between 400 and 550 °C. By using such a wide boiling oil it has been found possible to reduce the iso-paraffin content of the resultant base oils for both the lower viscosity grades, ranging from 2 cSt at 100 °C kinematic viscosity, to and including the higher viscosity grades having a kinematic viscosity at 100 °C of 15 cSt.--

Paragraph on line 30 of page 5, ending on line 12 of page 6 has been amended as follows:

-- The dewaxed oil ~~can~~may be obtained as such by well known processes as for example described in Chapter 6 of Lubricant Base Oil and Wax Processing, Avilino Sequeira, Jr, Marcel Dekker, Inc. New York, 1994, page 119-150. The preferred wide boiling oil can be prepared by mixing various viscosity grades of, preferably API Group II or Group III, base oils. Examples of processes which yield an oil which ~~can~~may be used in

this process are described in EP-A-0909304, EP-A-1137741, EP-A-1392799, EP-A-1311651. Examples of suitable dewaxed oils are for example Shell's XHVI-4, XHVI-5.2 and XHVI-8 base oil products or ExxonMobil's Visom base oil grades and mixtures thereof. A possible commercial process which yields base oil for use in this invention is ExxonMobil's MSDWTM/MAXSATTM type of process which is said to yield a base oil containing less than 1 wt% aromatics, < 1ppm sulphur, a Viscosity Index of greater than 120 and a pour point of less than -15 °C.--

Paragraph on line 13 of page 6 has been amended as follows:

— A more preferred dewaxed oil, which meets the above description, are those is that obtained when the bottoms fraction of a fuels hydrocracker, as described above, is catalytically dewaxed followed by a hydrofinishing step. Examples of publications describing this route are WO-A-9802502, WO-A-0027950, WO-A-9500604, EP-A-0883664 and EP-A-0863963.—

Paragraph on line 20 of page 6, ending on line 8 of page 7 has been amended as follows:

— An additional advantage of adding a dewaxed oil as described above to the pour point reducing treatment of the process of the invention is that any undesired compounds in said oil, such as for example wax, polars, sulphur or nitrogen, can may be further reduced in said treatment. A further advantage is that the boiling range properties, pour point and/or the volatility of the final base oil can may be controlled in a simple manner by control of the dewaxing conditions and the optional further distillation of the product obtained in said dewaxing treatment. This is advantageous because it makes possible to the use of a wide variation of dewaxed oils in the process according to the invention possible. If for example such oils would have been blended after the dewaxing of a 100% Fischer-Tropsch derived feed and after a final distillation much more stringent property specifications, like for example Noack volatility and viscosity, for the mineral derived blending component would have been required. Thus the process according the invention makes it possible to use a wide variation of dewaxed oils having the above properties and obtain a base oil having the desired paraffin content and other desired base oil properties like especially Noack volatility and pour point. —

Paragraph on line 9 of page 7 has been amended as follows:

-- The Fischer-Tropsch derived feed preferably is a hydroisomerized Fischer-Tropsch wax. Such a feed may be obtained by well-known processes, for example the so-called commercial Sasol process, the Shell Middle Distillate Process or by the non-commercial Exxon process. These and other processes are for example described in more detail in EP-A-776959, EP-A-668342, US-A-Pat. No.4943672, US-A-Pat. No.5059299, WO-A-9934917 and WO-A-9920720. The process will generally comprise a Fischer-Tropsch synthesis and a hydroisomerisation step as described in these publications. Such a process to prepare the hydroisomerised Fischer-Tropsch feed for use as feed in the present process will comprise the following steps: (a)

(b) separating by means of distillation the product of step (a) into one or more gas oil fractions and a higher boiling Fischer-Tropsch derived feed according to this invention.--

Paragraph on line 28 of page 8, ending on line 11 of page 9 has been amended as follows:

-- The initial boiling point of the Fischer-Tropsch product may range up to 400 °C, but is preferably below 200 °C. Preferably any compounds having 4 or less carbon atoms and any compounds having a boiling point in that range are separated from a Fischer-Tropsch synthesis product before the Fischer-Tropsch synthesis product is used in step (a). The Fischer-Tropsch product as described in detail above is a Fischer-Tropsch product, which has not been subjected to a hydroconversion step as defined according to the present invention. The content of non-branched compounds in the Fischer-Tropsch product will therefore be above 80 wt%. In addition to the Fischer-Tropsch product also other fractions may also be additionally processed in step (a). Possible other fractions may suitably be the optional higher boiling fraction obtained in step (b) or part of said fraction and/or off-spec base oil fractions as obtained in the pour point reducing treatment of the process of the present invention.--

Paragraph on line 12 of page 9 has been amended as follows:

-- Such a Fischer-Tropsch product can be obtained by any process[,]] which yields a relatively heavy Fischer-Tropsch product as described above. Not all Fischer-Tropsch processes yield such a heavy product. An example of a suitable Fischer-Tropsch

process is described in WO-A-9934917 and in AU-A-698392. These processes may yields a Fischer-Tropsch product as described above.--

Paragraph on line 6 of page 10, ending on line 3 of page 11 has been amended as follows:

-- The hydrocracking/hydroisomerisation reaction of step (a) is preferably performed in the presence of hydrogen and a catalyst, which catalyst can be chosen from those known to one skilled in the art as being suitable for this reaction of which some will be described in more detail below. The catalyst may in principle be any catalyst known in the art to be suitable for isomerising paraffinic molecules. In general, suitable hydroconversion catalysts are those comprising a hydrogenation component supported on a refractory oxide carrier, such as amorphous silica-alumina, alumina, fluorided alumina, molecular sieves (zeolites) or mixtures of two or more of these. One type of preferred catalysts to be applied in the hydroconversion step in accordance with the present invention are hydroconversion catalysts comprising platinum and/or palladium as the hydrogenation component. A very much preferred hydroconversion catalyst comprises platinum and palladium supported on an amorphous silica-alumina (ASA) carrier. The platinum and/or palladium is suitably present in an amount of from 0.1 to 5.0% by weight, more suitably from 0.2 to 2.0% by weight, calculated as element and based on total weight of carrier. If both are present, the weight ratio of platinum to palladium (calculated as element) may vary within wide limits, but suitably is in the range of from 0.05 to 10, more suitably 0.1 to 5. Examples of suitable noble metal on ASA catalysts are, for instance, disclosed in WO-A-9410264 and EP-A-0582347. Other suitable noble metal-based catalysts, such as platinum on a fluorided alumina carrier, are disclosed in e.g. US-A-Pat. No.5059299 and WO-A-9220759. Preferably such catalysts do not comprise a molecular sieve, more preferably such catalysts do not comprise zeolite beta.--

Paragraph on line 20 of page 11 has been amended as follows:

-- A preferred catalyst which can be used in a non-sulphided form comprises a non-noble Group VIII metal, e.g., iron, nickel, in conjunction with a Group IB metal, e.g., copper, supported on an acidic support. The catalyst preferably has a surface area in the range of 200-500 m²/gm, preferably 0.35 to 0.80 ml/gm, as determined by water adsorption, and a bulk density of about 0.5-1.0 g/ml. The catalyst support is preferably an amorphous silica-alumina where the alumina is present in amounts of less than about 30 wt%,

preferably 5-30 wt%, more preferably 10-20 wt%. Also, the support may contain small amounts, e.g., 20-30 wt%, of a binder, e.g., alumina, silica, Group IVA metal oxides, and various types of clays, magnesia, etc., preferably alumina.--

Paragraph on line 27 of page 13, ending on line 9 of page 14 has been amended as follows:

— In step (b) the product of step (a) is separated into one or more gas oil fractions and a Fischer-Tropsch derived feed having preferably a $T_{10\text{wt\%}}$ $T_{10\text{wt\%}}$ boiling point of between 200 and 450 °C. If a higher boiling fraction is separated from the Fischer Tropsch feed the $T_{90\text{-wt\%}}$ $T_{90\text{-wt\%}}$ of said feed is preferably between 300 °C, and preferably between 430 and 550 °C. The separation is preferably performed by means of a first distillation at about atmospheric conditions, preferably at a pressure of between 1.2-2 bara, wherein the gas oil product and lower boiling fractions, such as naphtha and kerosine fractions, are separated from the higher boiling fraction of the product of step (a). The higher boiling fraction, of which suitably at least 95 wt% boils above 370 °C, may be further separated in a vacuum distillation step wherein a higher boiling fraction is separated. The vacuum distillation is suitably performed at a pressure of between 0.001 and 0.05 bara --

Paragraph on line 17 of page 14 has been amended as follows:

-- The mixture of petroleum derived and Fischer-Tropsch derived feeds will suitably have a viscosity corresponding to the desired viscosity of the base oil product. Preferably the kinematic viscosity at 100 °C of the mixture is between 3 and 10 cSt. Suitable distillate fractions have a $T_{10\text{wt\%}}$ $T_{10\text{wt\%}}$ boiling point of between 200 and 450 °C, preferably between 300 and 420 °C and a $T_{90\text{-wt\%}}$ $T_{90\text{-wt\%}}$ boiling point of between 300 and 550 °C, preferably between 400 and 550 °C. The fraction of petroleum derived feed in the mixture is preferably higher than 5 wt%, more preferably higher than 10 wt% and preferably lower than 50 wt% and more preferably below 30 wt% and even more preferably below 25 wt%. The actual content of petroleum-derived feed in the mixture will of course depend on the paraffin content of said feed. The mixture will preferably contain less than 50 ppm sulphur and/or less than 10 ppm nitrogen.—

Paragraph on line 3 of page 15 has been amended as follows:

-- The catalytic dewaxing or pour point reducing process can be performed by any process wherein in the presence of a catalyst and hydrogen the pour point of the mixture is reduced as specified above. Suitable dewaxing catalysts are heterogeneous catalysts comprising a molecular sieve and optionally in combination with a metal having a hydrogenation function, such as the Group VIII metals. Molecular sieves, and more suitably intermediate pore size zeolites, have shown a good catalytic ability to reduce the pour point of the distillate base oil precursor fraction under catalytic dewaxing conditions. Preferably the intermediate pore size zeolites have a pore diameter of between 0.35 and 0.8 nm. Suitable intermediate pore size zeolites are mordenite, ZSM-5, ZSM-12, ZSM-22, ZSM-23, SSZ-32, ZSM-35 and ZSM-48. Another preferred group of molecular sieves are the silica-aluminaphosphate (SAPO) materials of which SAPO-11 is most preferred as for example described in US-A-Pat. No. 4859311. ZSM-5 may optionally be used in its HZSM-5 form in the absence of any Group VIII metal. The other molecular sieves are preferably used in combination with an added Group VIII metal. Suitable Group VIII metals are nickel, cobalt, platinum and palladium. Examples of possible combinations are Ni/ZSM-5, Pt/ZSM-23, Pd/ZSM-23, Pt/ZSM-48 and Pt/SAPO-11. Further details and examples of suitable molecular sieves and dewaxing conditions are for example described in WO-A-9718278, US-A-Pat. No. 5053373, US-A-Pat. No. 5252527 and US-A-Pat. No. 4574043.--

Paragraph on line 31 of page 15, ending on line 13 of page 16 has been amended as follows:

--The dewaxing catalyst suitably also comprises a binder. The binder ~~can~~ may be a synthetic or naturally occurring (inorganic) substance, for example clay, silica and/or metal oxides. ~~Natural~~ Naturally occurring clays are for example of the montmorillonite and kaolin families. The binder is preferably a porous binder material, for example a refractory oxide of which examples are: alumina, silica-alumina, silica-magnesia, silica-zirconia, silica-thoria, silica-beryllia, silica-titania as well as ternary compositions for example silica-alumina-thoria, silica-alumina-zirconia, silica-alumina-magnesia and silica-magnesia-zirconia. More preferably a low acidity refractory oxide binder material which is essentially free of alumina is used. Examples of these binder materials are silica, zirconia, titanium dioxide, germanium dioxide, boria and mixtures of two or more of these of which examples are listed above. The most preferred binder is silica.--

Paragraph on line 14 of page 16 has been amended as follows:

-- A preferred class of dewaxing catalysts comprise intermediate zeolite crystallites as described above and a low acidity refractory oxide binder material which is essentially free of alumina as described above, wherein the surface of the aluminosilicate zeolite crystallites has been modified by subjecting the aluminosilicate zeolite crystallites to a surface dealumination treatment. A preferred dealumination treatment is by contacting an extrudate of the binder and the zeolite with an aqueous solution of a fluorosilicate salt as described in for example US-A-Pat. No.5157191 or WO-A-2000029511. Examples of suitable dewaxing catalysts as described above are silica bound and dealuminated Pt/ZSM-5, silica bound and dealuminated Pt/ZSM-23, silica bound and dealuminated Pt/ZSM-12, silica bound and dealuminated Pt/ZSM-22 as for example described in WO-A-200029511 and EP-B-832171.--

Paragraph on line 3 of page 19, ending on line 10 of page 20 has been amended as follows:

-- After performing the catalytic pour point reducing treatment or after the optional hydrofinishing step hydrogen is suitably separated from the dewaxed/hydrofinished effluent, contacted with a means to remove hydrogen sulphide and recycled to said catalytic pour point reducing treatment. Such means could be amine washing of the hydrogen recycle stream. If the content of hydrogen sulphide is expected to be low, for example below 100 ppm or even below 20 ppm, in the recycle stream contacting said stream with a suitable adsorbent will be preferred. Examples of suitable heterogeneous adsorbents are those that comprise at least one metal or oxide of the metal, the metal(s) being selected from Fe, Ni, Co, Ag, Sn Re, Mo, Cu, Pt, Pd and Zn. In a preferred embodiment, the metal is at least one of Fe, Ni, Co, Cu, and Zn. In a more preferred embodiment the adsorbent is zinc oxide. The adsorbent may be supported on an inorganic support material in order to, for example, increase surface area, pore volume, and pore diameter. Suitable support materials contain at least one inorganic refractory support materials including, but not necessarily limited to, alumina, silica, zirconia, carbon, silicon carbide, kieselguhr, amorphous and crystalline silica-aluminas, silica-magnesias, aluminophosphates, boria, titania, and zinc oxide. Preferred support materials include alumina, zirconia, and silica. The metal(s) or metal oxide(s) may be loaded onto these supports by conventional techniques known in the art. Non-limiting examples of suitable supported metal and metal oxide based regenerable sulfur adsorbents include, but are not

necessarily limited to: Co/Al₂O₃; Co/SiO₂; Co/TiO₂; Co/ZrO₂; Ni/Al₂O₃; Ni/SiO₂; Ni/ZrO₂; Cu/Al₂O₃; Cu/SiO₂; Cu/ZrO₂; Fe/Al₂O₃; Fe/SiO₂; Fe/ZrO₂; Co/Cu/Al₂O₃; Co/Cu/SiO₂; Ni/Cu/SiO₂; Ni/Cu/ZrO₂; Co/Pt/Al₂O₃; Co/Pd/SiO₂; Co/Sn/Al₂O₃; Ni/Sn/SiO₂; Zn/Al₂O₃, ZnO/SiO₂, Co/ZnO; Mo/ZnO; Ni/ZnO; Co/Mo/ZnO; Ni/Mo/ZnO; Pt/ZnO; Pd/ZnO; Pt/Pd/ZnO. The adsorbent may also be employed as a bulk metal oxide or as a bulk metal, including but not necessarily limited to, a finely divided skeleton metal, including Raney metals, ponderous metals, Rieke metals, and metal sponges. The temperature and pressure conditions during said contacting are preferably within the ranges specified for the catalytic pour point reduction.--

Paragraph on line 21 of page 20 has been amended as follows:

-- The above-described base oil ~~can~~may suitably find use as base oil for an Automatic Transmission Fluids (ATF), motor engine oils, electrical oils or transformer oils and refrigerator oils. ~~Lubricant Lubricant~~ formulations such as motor engine oils of the 0W-x and 5W-x specification according to the SAE J-300 viscosity classification, wherein x is 20, 30, 40, 50 or 60 may be advantageously made using this base oil. --

Paragraph on line 1 of page 21 has been amended as follows:

-- The Fischer-Tropsch process is sometimes performed at a remote location far away from the end-users of the base oils. It has also been found that for certain applications the end-users do not necessarily require base oils having the high paraffin contents as prepared by the prior art processes which operate on 100 % Fischer-Tropsch derived feed. For these applications blending with mineral derived base oils containing ~~less a lower amount of~~ paraffins will ~~have to take place such to~~ reduce the paraffin content. It is however not always the case that suitable mineral blending components are found near the end users. As explained above such blending components ~~need to~~ should have the right volatility and viscosity to obtain the desired blend. The present invention solves this problem, wherein at the remote location the desired lower paraffin base oils are prepared having the specified volatility and viscosity and in addition pour point and viscosity index from a petroleum derived feed which does not have to meet all the stringent quality properties. Thus a process is obtained wherein for example the petroleum derived feed is obtained from one location and the base oils

obtained by the present process are marketed in many different locations. In a preferred embodiment the petroleum derived feed is shipped to the remote location from another location and part of the base oils as made by the present process are shipped to said other location making use of the same vessel. This is advantageous because efficient use of shipping capacity between the two locations is thus achieved. Such a method is especially suitable when the petroleum derived feed is a dewaxed oil having the preferred low sulphur contents as described above.—

Paragraph on line 1 of page 23 has been amended as follows:

—* N.a.= not analysed. In view of Fischer-Tropsch source it is expected that than these values are lower than the detection limit—

Paragraph on line 9 of page 27, ending on line 9 has been amended as follows:

— From the effluent of the dewaxing step a base oil boiling between 400 and 470 °C was isolated from lower and higher boiling products. The yield of this fraction was 40 wt% on the blended feed. The pour point was –30 °C, the Kinematic viscosity at 100 °C was 4,059 4.059 cSt and the Viscosity Index was 129. The composition of this fraction was analysed using the following technique.—

On page 31 above line 1, insert --We claim:--